WASTE MANAGEMENT

An International Journal of Industrial, Hazardous and Radioactive Waste Management, Science and Technology

Coeditor-in-Chief
Allan M. Ford
Lamar University

Coeditor-in-Chief
William A. Cawley
Lamar University

Founding Editor
A. Alan Moghissi
University of Maryland

List of Contents and Author Index
Volume 16, 1996

PERGAMON

WASTE MANAGEMENT

Editor-in-Chief:
William A. Cawley, Lamar University, Beaumont, TX 77710-0613, U.S.A.

Associate Editors
Jack Hopper, Department of Chemical Engineering, Lamar University, Beaumont, TX 77710-0613, U.S.A.
Tel: 409-880-8785; Fax: 409-880-8791: E-mail: hopperjr@hal.lamar.edu

Ralph Pike, Department of Chemical Engineering, Louisiana State University, Baton Rouge, LA 70803-7303, U.S.A.
Tel: 504-388-1426; Fax: 504-388-1476; E-mail: chepik@lsuvm.sncc.lsu.edu

Jim Alleman, Department of Civil Engineering, Purdue University, West Lafayette, IN 47907-1107, U.S.A.
Tel: 765-494-7705; Fax: 765-496-1107; E-mail: alleman@ce.ecn.purdue.edu

Associate Editor and Regional Editor, Europe
Warren Pescod, Department of Civil Engineering, Cassie Building, University of Newcastle, Newcastle upon Tyne NE1 7RU, U.K.
Tel: 0191-222-6000; Fax: 0191-222-6502; E-mail: m.b.pescod@ncl.ac.uk

Regional Editor, Asia
Ting-Chia Huang, Chemical Engineering Department, National Cheng Kung University, Tainan, Taiwan 70101, Republic of China
Tel: 886-6-2757575 Ext. 62600; Fax: 886-6-2344496

Assistant Editor/Book Review Editor
Carol Stokes-Cawley

Editorial Office
Waste Management, 21 Griffin Street, Skaneateles, NY 13152-1006, U.S.A.
Tel/Fax: 315-685-0768; E-mail: stocaw@aol.com

Founding Editor
A. Alan Moghissi

Publishing and Advertising Offices
Elsevier Science Ltd, The Boulevard, Langford Lane, Kidlington, Oxford OX5 1GB, U.K. Tel: (01865) 843000; Fax: (01865) 843010.

Published 8 issues per year in February, April, June, July, August, October, November and December.

Subscription Information
Annual Institutional Subscription Rates 1997: Europe, The CIS and Japan, 1646.00 Dutch Guilders. All other countries, U.S.$1016.00. Associated Personal Subscription rates are available on request for those whose institutions are library subscribers. Dutch Guilder prices exclude VAT. Non-VAT registered customers in the European Community will be charged the appropriate VAT in addition to the price listed. Prices include postage and insurance and are subject to change without notice.

Any enquiry relating to subscriptions should be sent to:
The Americas: Elsevier Science, Customer Support Department, P.O. Box 945, New York, NY 10010, U.S.A. [Tel: (+1) 212-633-3730/1-888 4ES-INFO; Fax: (+1) 212-633-3680; E-mail: usinfo-f@elsevier.com].
Japan: Elsevier Science Customer Support Department, 9–15 Higashi-Azabu 1-chome, Minato-ku, Tokyo 106, Japan [Tel: (+3) 5561-5033; Fax: (+3) 5561-5047; E-mail: kyf04035@niftyserve.or.jp].
Asia Pacific (*excluding Japan*): Elsevier Science (Singapore) Pte Ltd, No. 1 Temasek Avenue, 17-01 Millenia Tower, Singapore 039192 [Tel: (+65) 434-3727; Fax: (+65) 337-2230; E-mail: asiainfo@elsevier.com.sg].
Rest of the World: Elsevier Science Customer Service Department, P.O. Box 211, 1001 AE Amsterdam, The Netherlands [Tel: (+31) 20-485-3757; Fax: (+31) 20-485-3432; E-mail: nlinfo-f@elsevier.nl].

For orders, claims, product enquiries (no manuscript enquiries) please contact the Customer Support Department at the Regional Sales Office nearest to you.

ContentsDirect
ContentsDirect delivers the table of contents of this journal, by E-mail, approximately two to four weeks prior to the publication of each issue. To subscribe to this free service, please complete and return the form at the back of this issue to your nearest Elsevier Science office, or send an E-mail message to d.jones@elsevier.co.uk.

Back Issues
Back issues of all previously published volumes are available direct from Elsevier Science offices (Oxford and New York). Complete volumes and single issues can be purchased for 1991–1995. Earlier issues are available in high quality photo-duplicated copies as complete volumes only. Back volumes on microfilm are available from UMI, 300 North Zeeb Road, Ann Arbor, MI 48106, U.S.A.

PERIODICALS POSTAGE PAID AT RAHWAY, NEW JERSEY. *Waste Management* (ISSN 0956-053X) is published 8 issues per year, February, April, June, July, August, October, November and December in one volume, by Elsevier Science Ltd, The Boulevard, Langford Lane, Kidlington, Oxford OX5 1GB, U.K. The annual subscription in the U.S.A. is $1016.00. *Waste Management* is distributed by Mercury Airfreight International Ltd, 2323 Randolph Avenue, Avenel, NJ 07001-2413. POSTMASTER: Please send address corrections to *Waste Management*, c/o Elsevier Science, Regional Sales Office, Customer Support Department, 655 Avenue of the Americas, New York, NY 10010, U.S.A. [Tel: (+1) 212-633-3730/1-888 4ES-INFO; Fax: (+1) 212-633-3680; E-mail: usinfo-f@ elsevier.com].

WASTE MANAGEMENT

Volume 16, Numbers 1–3 1996

CONTENTS

SPECIAL ISSUE—BULK "INERT" WASTE: AN OPPORTUNITY FOR USE

J. G. Cabrera **G. R. Woolley**	ix	*Editorial*
J. Hartlén	1	*Keynote Lecture*. Environmental Consequences of Using Residues
G. R. Woolley **R. Coombs**	7	The Significance of Improvements in Fly Ash Quality
E. Mulder	15	A Mixture of Fly Ashes as Road Base Construction Material
J. O. V. Tränkler **I. Walker** **M. Dohmann**	21	Environmental Impact of Demolition Waste—an Overview on 10 Years of Research and Experience
A. Mayer **T. Rey**	27	Innovative HSR Process to Transform Waste Incinerator Slag into Useful Mineral Additives
J. R. Barton **D. Dalley** **V. S. Patel**	35	Life Cycle Assessment for Waste Management
G. Dirk	51	Pulverised Fuel Ash Products Solve the Sewage Sludge Problems of the Wastewater Industry
J. Geiseler	59	Use of Steelworks Slag in Europe
H. A. van der Sloot	65	*Keynote Lecture*. Developments in Evaluating Environmental Impact from Utilization of Bulk Inert Wastes Using Laboratory Leaching Tests and Field Verification
D. Rockliff	83	Low-grade Quarry Products, Reclaimed Aggregates and Inert Wastes—Their Use in Unbound Mixtures for Road Pavements
M. C. M. Nunes **M. G. Bridges** **A. R. Dawson**	87	Assessment of Secondary Materials for Pavement Construction: Technical and Environmental Aspects
R. Hanni	97	Energy and Valuable Material By-product from Firing Estonian Oil Shale
B. G. Clarke **R. Coombs**	101	Specifying and Using Pulverised Fuel Ash as an Engineered Fill
J. Rogbeck **J. Hartlén**	109	Ash Gravel—a Material for Recycling
M. Barra de Oliveira **E. Vazquez**	113	The Influence of Retained Moisture in Aggregates from Recycling on the Properties of New Hardened Concrete

J. Payá **J. Monzó** **M. V. Borrachero** **E. Peris-Mora**	119	Comparisons Among Magnetic and Non-magnetic Fly Ash Fractions: Strength Development of Cement–Fly Ash Mortars
J. Rogbeck **Å. Knutz**	125	Coal Bottom Ash as Light Fill Material in Construction
C. A. Johnson **M. Kersten** **F. Ziegler** **H. C. Moor**	129	Leaching Behaviour and Solubility—Controlling Solid Phases of Heavy Metals in Municipal Solid Waste Incinerator Ash
S. T. Jarvis **T. G. Brooks**	135	The Use of PFA: Cement Pastes in the Stabilization of Abandoned Mineworkings
C. Plowman **J. G. Cabrera**	145	The Use of Fly Ash to Improve the Sulphate Resistance of Concrete
M. Zakaria **J. G. Cabrera**	151	Performance and Durability of Concrete Made with Demolition Waste and Artificial Fly Ash–Clay Aggregates
F. P. Glasser	159	*Keynote Lecture*. Properties of Cement Waste Composites
D. R. Davies **J. N. Kitchener**	169	Massive Use of Pulverised Fuel Ash in Concrete for the Construction of a U.K. Power Station
E. Mulder	181	Pre-treatment of MSWI Fly Ash for Useful Application
M. M. C. Alkemade **J. I. A. Koene**	185	The Useful Application of Sulphur-bound Waste Materials
G. S. Ghataora **S. T. Jarvis**	189	Use of Colliery Spoil for Infilling Mine Workings
T. W. Cousens **P. G. Studds**	195	The Attenuation and Leaching Behaviour of Colliery Spoils
W. W. Todd	203	PFA—a Component in Building Materials Produced from the German Plastic Packaging Waste Stream
J. C. Cooper	209	*Keynote Lecture*. Controls and Incentives: a Framework for the Utilisation of Bulk Wastes
J. G. Cabrera **G. R. Woolley**	215	Life Cycle Benefits of Calcium Silicate Replacements
P. Molus **D. Rieley** **G. Sherlock** **K. Walmsley**	221	Inert Wastes—a Live Issue
J. Beretka **R. Cioffi** **M. Marroccoli** **G. L. Valenti**	231	Energy-saving Cements Obtained from Chemical Gypsum and Other Industrial Wastes
M. M. Th. Eymael **H. A. W. Cornelissen**	237	Processed Pulverized Fuel Ash for High-performance Concrete
R. C. Owen **J. E. Parker**	243	Recycling for Reinstatement—the Gas Experience

Volume 16, Number 4 1996

CONTENTS

W. A. Cawley	v	*Editorial*
		Original Contributions
M. A. Awwal **M. F. R. Guzella** **T. V. Silva**	251	Chemical Treatment of Simulated Solution of Evaporator Concentrate for Immobilization in Bitumen
N. Dhamo	257	Electrochemical Oxidation of Cyanide in the Hydrocyclone Cell
M. J. Carey **S. D. Nagelski**	263	Treatment Alternatives for Lead Impacted Media: Case Studies
R. D. Reid **D. Schneidmiller**	271	Resolution of the Mixed Waste Issue for EDTA-based Steam Generator Chemical Cleaning Waste Solutions
T. M. Aminabhavi **R. S. Munnolli** **J. D. Ortego**	277	Molecular Migration of Some Industrial Solvents Into Fluoropolymer Membranes
H. R. Snyder **C. B. Fleddermann** **J. M. Gahl**	289	Destruction of Acetone Using a Small-scale Arcjet Plasma Torch
M. L. D. Gougar **B. E. Scheetz** **D. M. Roy**	295	Ettringite and C–S–H Portland Cement Phases for Waste Ion Immobilization: A Review
M. J. Rudin	305	Leaching of Selenium from Cement-based Matrices
I. Baek **W. W. Pitt, Jr**	313	Colloid-facilitated Radionuclide Transport in Fractured Porous Rock
H. W. Prengle, Jr **J. M. Symons** **D. Belhateche**	327	H_2O_2/VisUV Process for Photo-oxidation of Waterborne Hazardous Substances—C_1–C_6 Chlorinated Hydrocarbons
		Technical Note
P. Gupta **P. Chandra**	335	Response of Cadmium to *Ceratophyllum demersum* L., a Rootless Submerged Plant
		Book Reviews
R. W. Pike	339	*Hazard Identification and Risk Assessment* *Hazardous Substances on Spillage* *Major Hazards Onshore and Offshore II*

Volume 16, Numbers 5/6 1996

CONTENTS

SPECIAL ISSUE—CYCLE AND STABILIZATION TECHNOLOGIES OF MSW INCINERATION RESIDUE

W. A. Cawley	vii	*Editorial*
S. E. Sawell **S. Sakai**	ix	*Foreword*
		National Overview
S. Sakai **S. E. Sawell** **A. J. Chandler** **T. T. Eighmy** **D. S. Kosson** **J. Vehlow** **H. A. van der Sloot** **J. Hartlén** **O. Hjelmar**	341	World Trends in Municipal Solid Waste Management
S. E. Sawell **S. A. Hetherington** **A. J. Chandler**	351	An Overview of Municipal Solid Waste Management in Canada
T. T. Eighmy **D. S. Kosson**	361	U.S.A. National Overview on Waste Management
J. Vehlow	367	Municipal Solid Waste Management in Germany
H. A. van der Sloot	375	Present Status of Waste Management in The Netherlands
J. Hartlén	385	Waste Management in Sweden
O. Hjelmar	389	Waste Management in Denmark
S. Sakai	395	Municipal Solid Waste Management in Japan
		Melting and Utilization
Y. Nabeshima	407	Summary of Research on Waste Minimization Studies by Japan Waste Research Foundation (JWRF)
H. Jimbo	417	Plasma Melting and Useful Application of Molten Slag
K. Kinto	423	Ash Melting System and Reuse of Products by Arc Processing
S. Abe **F. Kambayashi** **M. Okada**	431	Ash Melting Treatment by Rotating Type Surface Melting Furnace
M. Nishigaki	445	Reflecting Surface-melt Furnace and Utilization of the Slag
T. Ito	453	Vitrification of Fly Ash by Swirling-flow Furnace
M. Kouda	461	Experimental Pavement Using Household Waste Slag
		Stabilization and Recovery
T. Uchida **I. Itoh** **K. Harada**	475	Immobilization of Heavy Metals Contained in Incinerator Fly Ash by Application of Soluble Phosphate—Treatment and Disposal Cost Reduction by Combined Use of "High Specific Surface Area Lime"

I. Kawakami
M. Esaki
I. Tetsuyama
M. Sumitomo
483 Immobilization of Fly Ash from MSW Incinerators and Ash-melting Furnaces

H. Katsuura
T. Inoue
M. Hiraoka
S. Sakai
491 Full-scale Plant Study on Fly Ash Treatment by the Acid Extraction Process

C. Izumikawa
501 Metal Recovery from Fly Ash Generated from Vitrification Process for MSW Ash

General Session Papers

K. Nakamura
S. Kinoshita
H. Takatsuki
509 The Origin and Behavior of Lead, Cadmium and Antimony in MSW Incinerator

M. Osako
N. Machida
M. Tanaka
519 Risk Management Measures Against Antimony in Residue after Incineration of Municipal Waste

A. Kida
Y. Noma
T. Imada
527 Chemical Speciation and Leaching Properties of Elements in Municipal Incinerator Ashes

S. Mizutani
T. Yoshida
S. Sakai
H. Takatsuki
537 Release of Metals from MSWI Fly Ash and Availability in Alkali Condition

T. Shimaoka
M. Hanashima
545 Behavior of Stabilized Fly Ashes in Solid Waste Landfills

H. Kaneko
555 Evaluation of Municipal Waste Incinerator Fly Ash Toxicity and the Role of Cadmium by Two Aquatic Toxicity Tests

---

Volume 16, Number 7 1996

Original Contributions

H. Q. Yu
G. W. Gu
561 Treatment of Phenolic Wastewater by Sequencing Batch Reactors with Aerated and Unaerated Fills

M. A. Line
C. D. Garland
M. Crowley
567 Evaluation of Landfarm Remediation of Hydrocarbon-contaminated Soil at the Inveresk Railyard, Launceston, Australia

B. Luckscheiter
M. Nesovic
571 Development of Glasses for the Vitrification of High Level Liquid Waste (HLLW) in a Joule Heated Ceramic Melter

P. A. Horne
P. T. Williams
579 Sampling and Analysis of Mercury Species in Effluent Gases Derived from Waste Incineration

C. T. Nhan
J. W. Graydon
D. W. Kirk
587 Utilizing Coal Fly Ash as a Landfill Barrier Material

G. Tiravanti **D. Petruzzelli** **R. Passino**	597	Low and Non Waste Technologies for Metals Recovery by Reactive Polymers
S. C. Sheppard **L. H. Johnson** **B. W. Goodwin** **J. C. Tait** **D. M. Wuschke** **C. C. Davison**	607	Chlorine-36 in Nuclear Waste Disposal—1. Assessment Results for Used Fuel with Comparison to ^{129}I and ^{14}C
C. W. Forsberg **E. C. Beahm** **G. W. Parker** **K. R. Elam**	615	Conversion of Radioactive and Hazardous Chemical Wastes into Borosilicate Glass Using the Glass Material Oxidation and Dissolution System
V. Dutré **C. Vandecasteele**	625	An Evaluation of the Solidification/Stabilisation of Industrial Arsenic Containing Waste Using Extraction and Semi-dynamic Leach Tests
Y. D. Harker **L. G. Blackwood** **T. R. Meachum** **W. Y. Yoon**	633	Uncertainty Analysis of a Nondestructive Radioassay System for Transuranic Waste
L. Fernandes **M. A. Warith** **F. La Forge**	649	Modelling of Contaminant Transport Within a Marshland Environment
		Book Reviews
F. K. Cartledge	663	*Stabilization and Solidification of Hazardous, Radioactive and Mixed Wastes*
D. D. Reible	663	*Volatile Organic Compounds in the Environment*

Volume 16, Number 8 1996

W. A. Cawley	v	*Editorial*
		Original Contributions
M. Singh **S. N. Upadhayay** **P. M. Prasad**	665	Preparation of Special Cements from Red Mud
Z. Lin **U. Qvarfort**	671	Predicting the Mobility of Zn, Fe, Cu, Pb, Cd from Roasted Sulfide (Pyrite) Residues—A Case Study of Wastes from the Sulfuric Acid Industry in Sweden
C. Carlsson Sanders	683	Electrochemical Reduction of Cr(VI) in the Decontamination Process ELDECON
T. F. McGowan **B. A. Greer** **M. Lawless**	691	Thermal Treatment and Non-thermal Technologies for Remediation of Manufactured Gas Plant Sites
J. Mácsik **A. Jacobsson**	699	Leachability of V and Cr from LD-slag/Portland Cement Stabilised Sulphide Soil

R. Derie	711	A New Way to Stabilize Fly Ash from Municipal Incinerators
K. A. Baltpurvins **R. C. Burns** **G. A. Lawrance**	717	Heavy Metals in Wastewater: Modelling the Hydroxide Precipitation of Copper(II) from Wastewater Using Lime as the Precipitant
K. M. Leonard **T. LeDuc** **R. K. Mixon**	727	Analysis of a System for Remote, Dry Removal of Solidified Mixed Waste
K. Ragland **J. Han** **D. Aerts**	735	Performance of an Aerodynamic Particle Separator
A. M. O. Mohamed	741	Remediation of Heavy Metal Contaminated Soils Via Integrated Electrochemical Processes
L. C. Lange **C. D. Hills** **A. B. Poole**	749	The Influence of Mix Parameters and Binder Choice on the Carbonation of Cement Solidified Wastes
L. C. Lange **C. D. Hills** **A. B. Poole**	757	The Effect of Accelerated Carbonation on the Properties of Cement-Solidified Waste Forms
		Technical Note
L. S. Simeonova **P. G. Dalev**	765	Utilization of a Leather Industry Waste
		Book Reviews
J. R. Hopper	771	*Pollution Prevention for Chemical Processes*
A. L. Mills	771	*Introduction to Environmental Technology*
	I	Volume Contents and Author Index for Volume 16, 1996